

Name: _____ (please print)

Signature: _____

ECE 2202 Quiz 5
November 14, 2024

1. This quiz is closed book, closed notes. You may have one 8.5 x 11" crib sheet.
2. Show all work necessary to complete the problem. A solution without the appropriate work shown will receive no credit. A solution which is not given in a reasonable order will lose credit.
3. Show all units in solutions, intermediate results, and figures. Units in the quiz will be included between square brackets.
4. If the grader has difficulty following your work because it is messy or disorganized, you will lose credit.
5. Do not use red ink. Do not use red pencil.
6. You will have 30 minutes to work on this quiz.

_____ /25

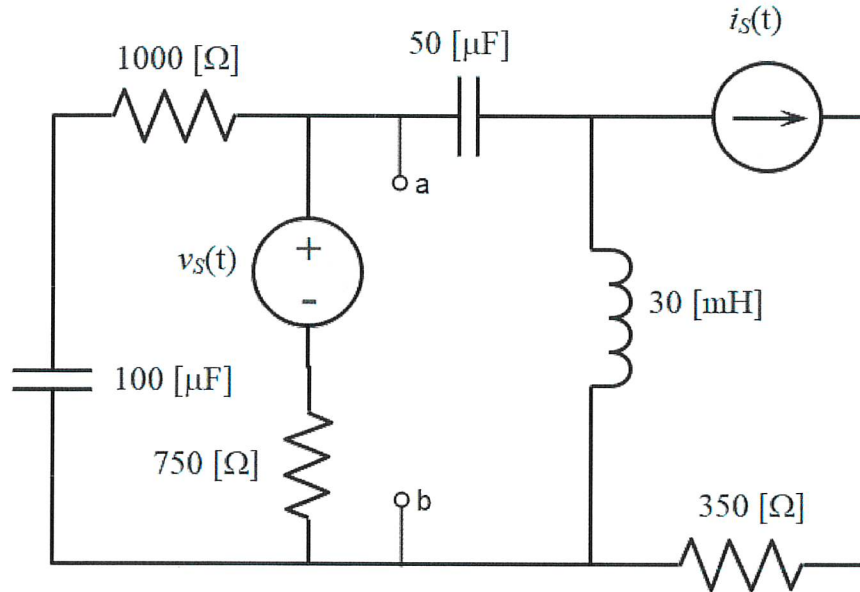
Room for extra work

For the circuit below, the sources are given as follows.

$$v_s(t) = 15.5[V] \cos(377t - 25^\circ)$$

$$i_s(t) = -42[mA] \sin(377t + 20^\circ)$$

- Draw this circuit in the phasor domain.
- Find the Thevenin equivalent circuit at terminals a, b, and draw the equivalent circuit in the phasor domain.



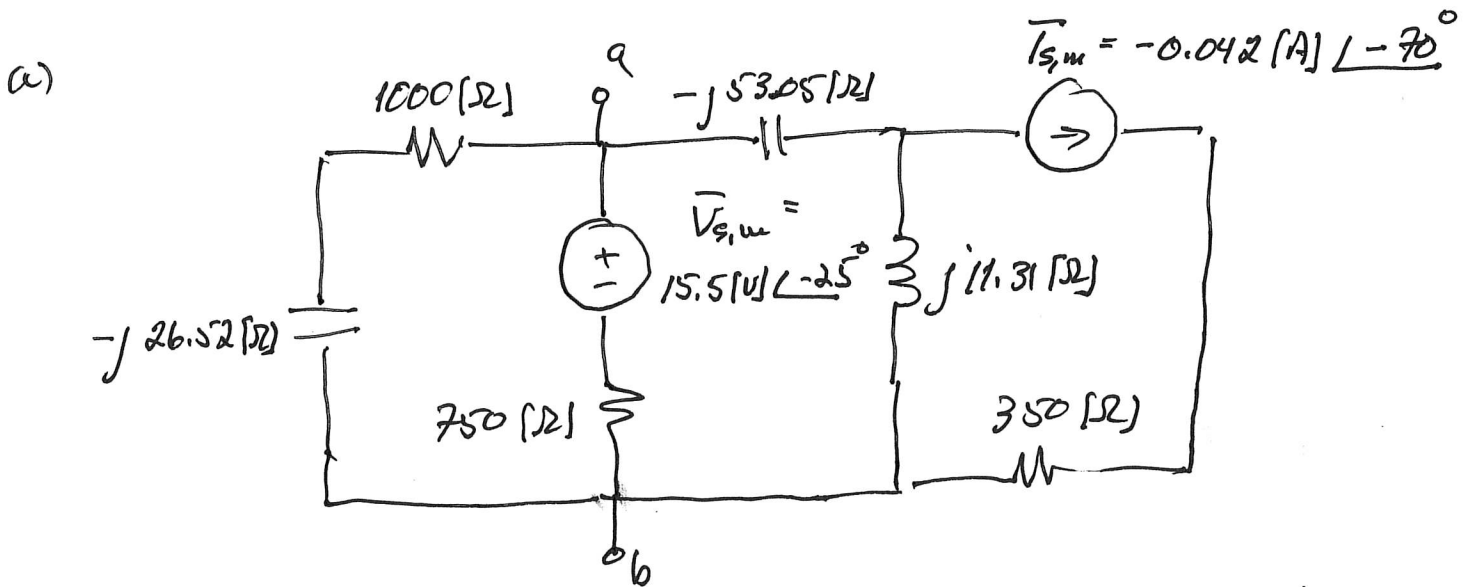
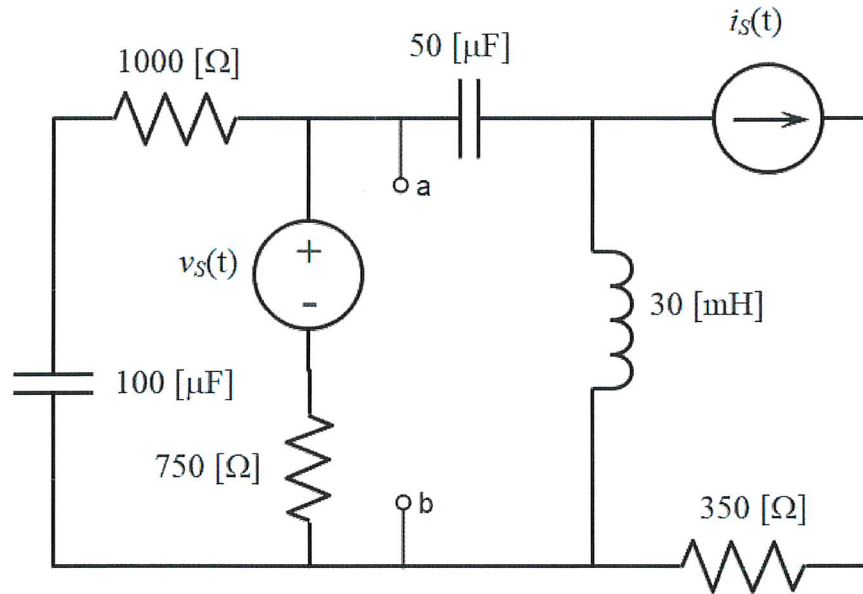
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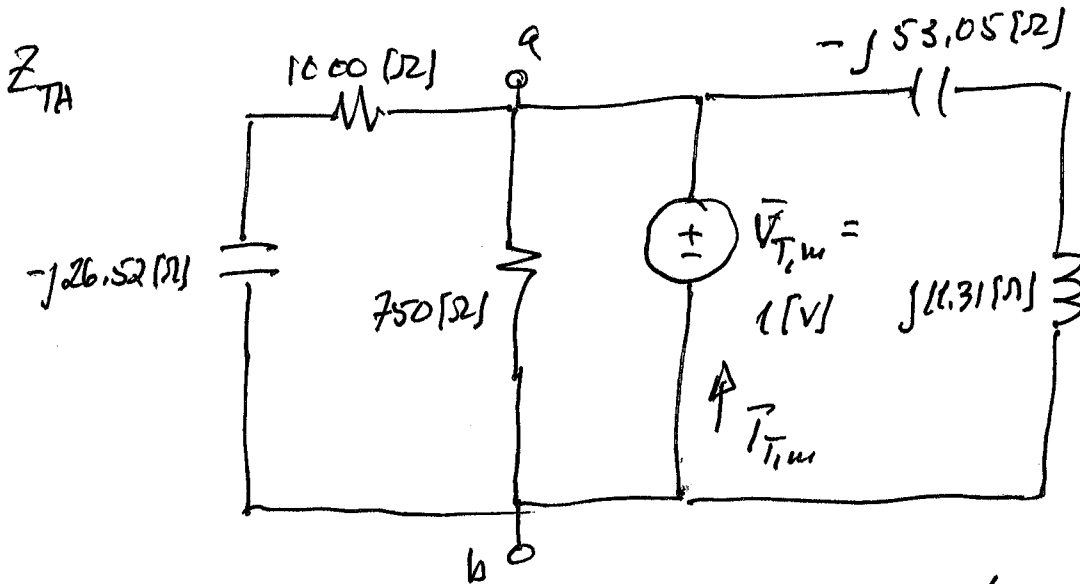
- Draw this circuit in the phasor domain.
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Note that we subtract 90° from the argument of \sin to make it \cos .

Room for extra work

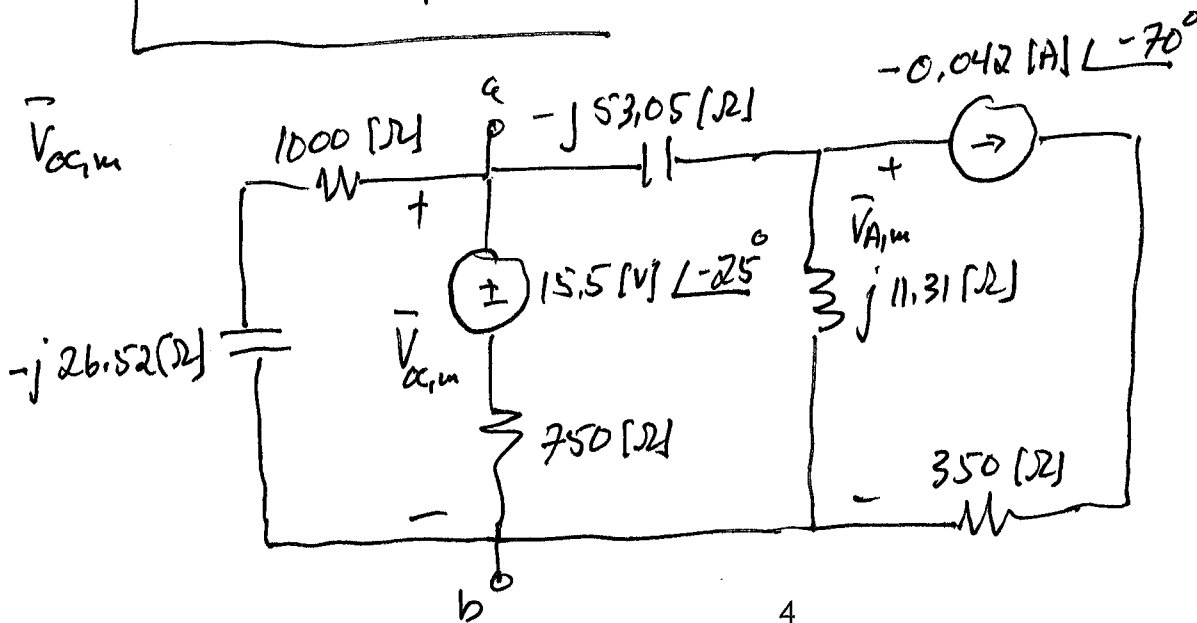
b) We need two of Z_{TH} via test source, $\bar{V}_{oc,m} = \bar{V}_{TH,m}$ and $\bar{I}_{sc,m}$. We will do all three here.



$$\bar{I}_{T,m} = \frac{1}{750} + \frac{1}{-j53.05 + j11.31} + \frac{1}{1000 - j26.52}$$

$$= 0.0241 \angle 84.44^\circ \text{ [A]}$$

$$Z_{TH} = \frac{1}{\bar{I}_{T,m}} = 41.498 \angle -84.44^\circ \text{ [}\Omega\text{]} = 4.017 - j40.303 \text{ [}\Omega\text{]}$$



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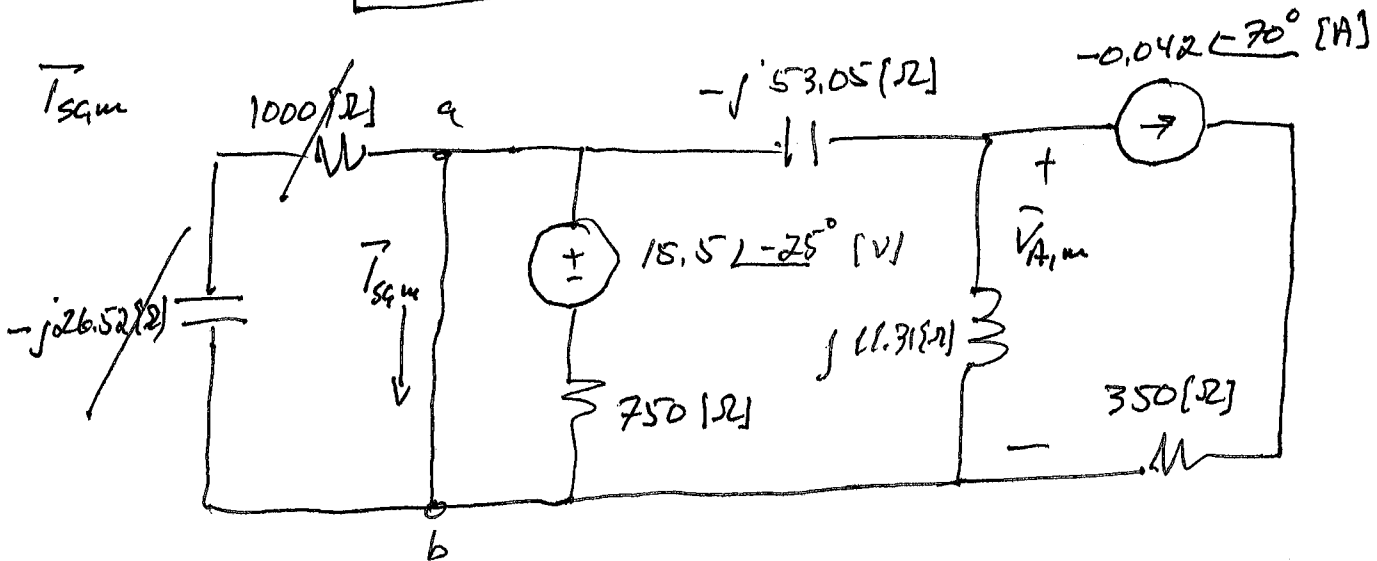
Room for extra work

$$\frac{\bar{V}_{oc,m} \angle -15.5^\circ}{750} + \frac{\bar{V}_{oc,m}}{1000 - j'26.52} + \frac{\bar{V}_{oc,m} - \bar{V}_{A,m}}{-j'53.05} = 0$$

$$\frac{\bar{V}_{A,m} - \bar{V}_{oc,m}}{-j'53.05} + \frac{\bar{V}_{A,m}}{j'11.31} - 0.042 \angle -70^\circ = 0$$

$$\bar{V}_{oc,m} = 0.6211 \angle -76.92^\circ \text{ [V]} \quad \bar{V}_{A,m} = 0.6450 \angle 39.99^\circ \text{ [V]}$$

$$\bar{V}_{TH,m} = 0.6211 \text{ [V]} \angle -76.92^\circ = 0.1406 - j'0.6050 \text{ [V]}$$



$$\frac{\bar{V}_{A,m}}{j'11.31} - 0.042 \angle -70^\circ + \frac{\bar{V}_{A,m}}{-j'53.05} = 0 \Rightarrow \bar{V}_{A,m} = 0.6037 \text{ [V]} \angle 20^\circ$$

$$\bar{I}_{sc,m} = \frac{15.5 \angle -25^\circ}{750} + \frac{\bar{V}_{A,m}}{-j'53.05} = 0.0150 \text{ [A]} \angle 7.52^\circ$$

$$\frac{\bar{V}_{TH,m}}{Z_{TH}} = 0.0148 \text{ [A]} \angle 7.52^\circ \quad \text{which within round-off is what we got for } \bar{I}_{sc,m}$$